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ALASKA FOREST RESEARCH CENTER
U. S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE

Number 4 | September 1959 | Juneau, Alaska

BIOLOGICAL EVALUATION OF AN ALASKA SPRUCE BEETLE INFESTATION IN SPRUCE STANDS ON THE KENAI RANGER DISTRICT

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INTRODUCTION

During the period August 26-31 G. L. Downing and R. A. Cook of the Alaska Forest Research Center made an aerial and ground examination of a bark beetle infestation in the spruce stands on the Kenai Ranger District. The aerial examination also included the northeastern part of the Kenai National Moose Range where heavy white spruce losses were noted. Losses in both areas, although believed caused by the same insect, are sufficiently removed from each other in distance and geographical features to be considered separately. The Moose Range infestation is therefore omitted from further discussion in this report.

Prior to 1958 bark beetle-caused losses were considered endemic.[1/] In 1958 losses increased[2/] and large group losses became evident in a few areas. This year the trend continued upward and outbreak conditions are known to exist in the following areas: Quartz Creek, Granite Creek, Resurrection Creek, and Palmer Creek. These areas total approximately 16,000 acres.

INSECT AND HOST

The taxonomy of the insect and of the host is doubtful. The area involved is a transitional one where two tree species and two insect species have overlapping ranges. The tree species are: white spruce (Picea glauca (Moench) Voss) and Sitka spruce (P. sitchensis (Bong.) Carr.). Hybrids of these two occur in this area and have been given the name P. x lutzii Little.[3/]

1/ Anonymous. Summary of forest insect conditions in Alaska. Alaska Forest Research Center, Juneau, Alaska. 1957.

2/ Anonymous. Summary of forest insect conditions in Alaska. Alaska Forest Research Center, Juneau, Alaska. 1958.

3/ Little, E. L., Jr. Check list of native and naturalized trees of the United States (including Alaska). U. S. Department of Agriculture Handbook No. 41. U. S. Government Printing Office, Washington, D.C. 1953.

The infested trees average approximately 13" dbh, with a maximum dbh near 20" and the minimum about 6" dbh.

The insect species present a somewhat analogous situation. The Alaska spruce beetle (Dendroctonus borealis Hopk.) attacks white spruce and the Sitka spruce beetle (D. obesus (Mann.)) attacks Sitka spruce. It has not been determined yet whether both of these insect species attack the hybrid spruce or which one alone. This is further complicated by the belief of some taxonomists 4/ 5/ that these two insects may in reality be one species that also includes two other presently distinct species, D. engelmanni Hopk. and D. piceaperda Hopk.

Perhaps for the present it is best to consider the host as P. x lutzii and the responsible insect as D. borealis. Actually it matters little what we call the insect since practically nothing is known of the biology of either of the species in Alaska.

Although nothing specific can be stated about the insect biology it will in general be similar to most bark beetle species. The eggs are laid by the adult female along galleries constructed in the cambium of the tree. Upon hatching the young larvae feed out from the main egg galleries and when full-grown pupate at the end of the larval galleries. The pupae transform into adults which repeat the process. The galleries constructed by the larvae and adults destroy portions of the cambium and limit the flow of nutrients in the tree. When a sufficient amount of cambium has thus been destroyed the tree will die.

INFESTATION AREA

The four infestation areas (see map) differ in accessibility and isolation from one another. Resurrection and Palmer Creeks are almost contiguous and can be considered as one unit. Palmer Creek is accessible by a dirt road but Resurrection Creek is roadless, the nearest road being just north of the infested area.

The Quartz Creek and Granite Creek areas are both bisected by the Seward Highway. The two areas are some distance apart and can probably be considered as separate units.

Spruce in all units predominates with but a scattering of other tree species, mostly Betula spp. and Populus sp.

Each unit is in a relatively narrow canyon surrounded by steep mountains. The timbered area is confined primarily to the canyon bottoms, progressing but slightly up the slopes.

Elevations range from about 600 feet to 2,000 feet.

4/ Swaine, J. M. Canadian Bark-Beetles, Part II. Technical Bulletin No. 14. Dominion of Canada, Department of Agriculture, Ottawa, Ontario. 1918.

5/ Chamberlin, W. J. The Scolytoidea of the Northwest. Oregon State Monograph No. 2. Oregon State College, Corvallis, Oregon. 1958.

INFESTATION TREND

Trend information is based upon an aerial estimate of the number of recently dead (abandoned) trees in each unit and the ground checking of a few group losses in the Quartz Creek unit and one group in the Granite Creek unit.

Estimated number of recently dead trees:

Resurrection Creek	300
Palmer Creek	50
Granite Creek	50
Quartz Creek	550

In ground checking, currently infested and recently dead trees were found in about equal numbers. It is likely that the same loss pattern prevails throughout all of the areas. Thus the estimated number of recently dead trees can also serve as a rough estimate of the number of currently infested trees.

It should be explained that the currently infested trees were totally green in appearance or but slightly faded and were not counted in the aerial estimate. The recently dead trees were considered as representing the past two years' loss.

The trend picture is difficult to assess because it is not known whether the insect has one generation per year or one every two years. There is some evidence that it has habits similar to, if not the same as, the Engelmann spruce beetle.6/ Hibernating adults have been observed at the base of some trees, as well as both overwintering larvae and adults higher up the boles of the same trees. This would tend to indicate that at least some of the individuals have a two-year life cycle.

Another unknown factor influencing trend is whether or not attacking adults will re-emerge and attack other green trees and how many times this might be repeated.

If all facets of this insect's biology were known there would undoubtedly be many other important factors to consider in determining the trend of an infestation.

In the absence of concrete evidence to the contrary, it can only be assumed that the infestation trend will continue at the present loss level or higher.

6/ Massey, C. L. and Wygant, N. D. Biology and control of the Engelmann spruce beetle in Colorado. U. S. Department of Agriculture Circular No. 944. U. S. Government Printing Office, Washington, D. C. 1954.

POTENTIAL THREAT

Some idea of the serious potential of the situation can be realized by a brief review of a few past outbreaks of this insect.7/

In the 1920's the Alaska spruce beetle was responsible for the loss of a high percentage of the trees within a 200,000-acre outbreak in the Copper River Valley between Chitina and McCarthy. In the 1940's white spruce losses of up to fifty percent of the stand were recorded over a large area along the Haines Cutoff Highway in Canada. In the late 1940's and early 1950's heavy losses occurred in the white spruce stands along the south side of Knik Arm near Anchorage.

There is little doubt that the Alaska spruce beetle ranks as the No. 1 insect enemy of white spruce in interior Alaska.

CONTROL POSSIBILITIES

Control of an Alaska spruce beetle outbreak in Alaska has never been attempted. There have, however, been many successful control programs carried on against bark beetles in coniferous stands in other parts of the country. Many of these projects have involved salvage logging, penetrating oil sprays, or a combination of the two. There is ample reason to believe, should control be deemed desirable, that these methods would prove effective in controlling the present outbreak.

Salvage logging is preferable to spraying because of the lower cost. Usually, because of inoperable areas or the unmerchantability of some infested trees, it is necessary to supplement logging with chemical control. When logging operators are not interested in handling the infested trees, the entire control program becomes one of chemical control. Regardless of the method of control it is necessary that as many as possible of the infested trees within a control unit be found and treated.

Should a decision be made in favor of control, and involve large numbers of trees for chemical treatment, it would be desirable to first have a pilot type control project. A pilot project would test the effectiveness of a penetrating oil spray against broods of the Alaska spruce beetle.

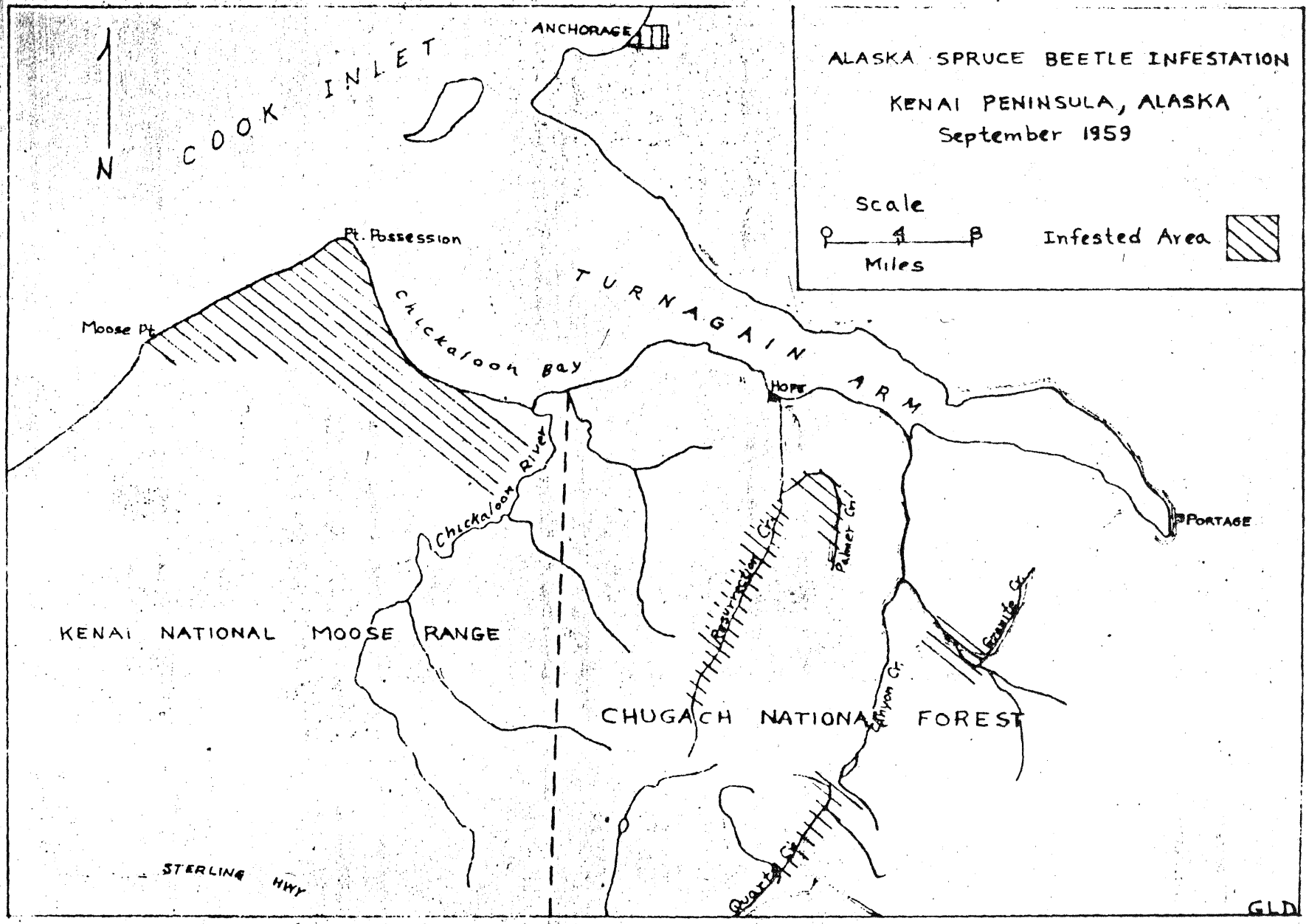
Two penetrating oil sprays are suggested,8/ one an oil solution and the other an oil-in-water emulsion. The trees are treated after felling, limbing, and bucking.

7/ Downing, G. L. The recent history of destructive forest insect activity in Alaska. Forest Insect Survey Report No. 1. Alaska Forest Research Center, Juneau, Alaska. 1957.

8/ Stevens, R. E. Ethylene dibromide sprays for controlling bark beetles in California. Forest Research Note No. 147. California Forest and Range Experiment Station, Berkeley, California. 1959.

Any control program should be limited primarily to that period of the year when the adult beetles are not flying and attacking new trees. The dates that adults fly and attack are not precisely known. Flight probably begins with the melting of snow and warmer days in late May or early June and lasts through June, July, and at least part of August. Any control should take place before or after these dates. For planning purposes it might be best to arbitrarily set the dates for control as before May 30 and after August 15.

The costs of treatment can only be approximated on a per-tree basis. These costs will vary considerably depending on the size of the area to be checked for infested trees, accessibility, the size of the trees to be treated, the control method, etc. A rough estimate is $10.00 per tree in Quartz, Granite, and Palmer Creeks and $15.00 per tree in Resurrection Creek.


ALASKA SPRUCE BEETLE INFESTATION
KENAI PENINSULA, ALASKA
September 1959
Scale
Miles
Infested Area
N
COOK INLET
ANCHORAGE
Pt. Possession
Moose Pt.
Chickaloon Bay
TURNAGAIN ARM
HOPE
PORTAGE
Chickaloon River
Resurrection Cr.
Palmer Cr.
Granite Cr.
Canyon Cr.
KENAI NATIONAL MOOSE RANGE
CHUGACH NATIONAL FOREST
STERLING HWY
Quartz Cr.
GLD